

The opinion in support of the decision being entered today
(1) was **not** written for publication in a law journal and
(2) is **not** binding precedent of the Board.

Paper No. 32

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte MASAHIRO KOIKE, FUMINOBU TAKAHASHI, HIDEKI INOUE,
YOSINORI MUSHI, SHUUJI KAMIMOTO, SHINJI NAITO, and TSUKASA
SASAKI

Appeal No. 1999-1663
Application No. 08/715,221

Heard: October 12, 2000

Before HAIRSTON, BARRY, and LEVY, ***Administrative Patent Judges.***
LEVY, ***Administrative Patent Judge.***

DECISION ON APPEAL

This is a decision on appeal under 35 U.S.C. § 134 from
the examiner's final rejection of claims 1, 4 and 12.¹

BACKGROUND

The appellant's invention relates to a stress evaluation
method for evaluating stress on a test piece based on changes
in acoustic velocity. An understanding of the invention can

¹ The rejection of claims 5-10 and 13 under 35 U.S.C. § 103 has been
withdrawn by the examiner (answer, pages 7 and 8).

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be derived from a reading of exemplary claim 1, the only independent claim on appeal, which is reproduced as follows:

1. A stress evaluation method for evaluating stress acting on a test piece to be tested from changes in an acoustic velocity of an acoustic wave which propagates through said test piece, wherein the stress evaluation method comprises the steps of:

changing a propagational direction of a surface wave which propagates in a surface layer of said test piece both at a non-loaded portion and a loaded portion of the test piece;

measuring an acoustic velocity of said surface wave; and

evaluating stress at the loaded portion of said test piece based on a difference in acoustic velocities of said surface wave between the non-loaded portion and the loaded portion of said test piece.

The prior art references of record relied upon by the examiner in rejecting the appealed claims are:

Thompson et al. (Thompson '836) 1978	4,080,836	Mar. 28,
Hildebrand 1980	4,210,028	Jul. 1,
Thompson et al. (Thompson '081) 1992	5,154,081	Oct. 13,

Claims 1, 4 and 12 stand rejected under 35 U.S.C. § 103 as being unpatentable over Thompson ('836) in view of Thompson ('081) and further in view of Hildebrand.

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Rather than reiterate the conflicting viewpoints advanced by the examiner and the appellant regarding the above-noted rejections, we make reference to the examiner's answer (Paper No. 25, mailed January 20, 1999) for the examiner's complete reasoning in support of the rejections, and to the appellants' brief (Paper No. 23, filed November 12, 1998) and reply brief (Paper No. 26, filed March 22, 1999) for the appellants' arguments thereagainst.

The appellants submit (brief, page 9) that the claims on appeal do not stand or fall together.

OPINION

In reaching our decision in this appeal, we have carefully considered the subject matter on appeal, the rejections advanced by the examiner, and the evidence of obviousness relied upon by the examiner as support for the rejections. We have, likewise, reviewed and taken into consideration, in reaching our decision, the appellants' arguments set forth in the briefs along with the examiner's rationale in support of the rejections and arguments in rebuttal set forth in the examiner's answer.

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It is our view, after consideration of the record before us, that the evidence relied upon and the level of skill in the particular art would not have suggested to one of ordinary skill in the art invention as set forth in claims 1, 4 and 12. Accordingly, we reverse, essentially for the reasons set forth by the appellants in the briefs.

In rejecting claims under 35 U.S.C. § 103, it is incumbent upon the examiner to establish a factual basis to support the legal conclusion of obviousness. ***See In re Fine***, 837 F.2d 1071, 1073, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). In so doing, the examiner is expected to make the factual determinations set forth in ***Graham v. John Deere Co.***, 383 U.S. 1, 17, 148 USPQ 459, 467 (1966), and to provide a reason why one having ordinary skill in the pertinent art would have been led to modify the prior art or to combine prior art references to arrive at the claimed invention. Such reason must stem from some teaching, suggestion or implication in the prior art as a whole or knowledge generally available to one having ordinary skill in the art. ***Uniroyal, Inc. v. Rudkin-Wiley Corp.***, 837 F.2d 1044, 1051, 5 USPQ2d 1434, 1438 (Fed. Cir.),

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488 U.S. 825 (1988); **Ashland Oil, Inc. v. Delta Resins & Refractories, Inc.**, 776 F.2d 281, 293, 227 USPQ 657, 664 (Fed. Cir. 1985), 475 U.S. 1017 (1986); **ACS Hosp. Sys., Inc. v. Montefiore Hosp.**, 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984). These showings by the examiner are an essential part of complying with the burden of presenting a **prima facie** case of obviousness. **Note In re Oetiker**, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992). If that burden is met, the burden then shifts to the applicant to overcome the **prima facie** case with argument and/or evidence. Obviousness is then determined on the basis of the evidence as a whole. **See id.**; **In re Hedges**, 783 F.2d 1038, 1039, 228 USPQ 685, 686 (Fed. Cir. 1986); **In re Piasecki**, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984); and **In re Rinehart**, 531 F.2d 1048, 1052, 189 USPQ 143, 147 (CCPA 1976).

We consider first the rejection of claim 1 based on the teachings of Thompson ('836), Thompson ('081), and Hildebrand. The examiner (answer, page 4) asserts that Thompson ('836) teaches propagating a surface wave through a test piece. The examiner's position is that Thompson ('836) discloses all of

the features of claim 1 with the exception (answer, page 4) that "Thompson ('836") fail to explicitly teach that said waves are acoustic waves." The examiner relies on Thompson ('081) and Hildebrand for a teaching that (answer, page 5) "one having ordinary skill in the art would recognize that the transducer of Thompson et al ('836") produces acoustic waves and thus the velocities that are measured are accordingly acoustic velocities."

The appellants do not challenge the fact that the invention of Thompson ('836) utilizes acoustic waves. However, the appellants assert (brief, page 12) that Thompson ('836) does not disclose a surface wave that propagates in a surface layer of the test piece as claimed, and that in Thompson ('836), the forces produced on the surface of the test block 3 of Thompson ('836) produce a transverse or shear wave which propagates through the thickness of the test block 3. The appellants' position (reply brief, page 4) is that the term "surface wave" in claim 1 has a specific meaning in the art. Included with the brief are, *inter alia*, Attachments "A" - "F", which the appellants rely upon for an explanation of

four types of waves that can propagate in an elastic body.
We summarize these waves as follows (brief,
page 18):

(1) "longitudinal waves" are body waves containing a compression element;

(2) "transverse or shear waves" are body waves containing only a shear component;

(3) "Rayleigh waves" are surface waves containing compression and shear components in phase quadrature, and

(4) "Love waves" are surface waves containing only a shear component.

The appellants acknowledge (brief, page 22) that "it appears from Attachments E and F that a disturbance in an elastic body will produce all four types of waves" The appellants assert (*id.*) that it is not entirely clear, however, that a transverse wave propagating through an elastic body as occurs in Thompson ('836) will produce the other three types of waves. The appellants further assert that even assuming **arguendo** that the transverse waves 5 and 29 of Thompson ('836) produce surface waves, the transducers 1 and 21 of Thompson ('836) cannot (brief, pages 23-24) detect surface waves, and therefore cannot measure the acoustic

velocity of the surface waves. In support of this position, the appellants rely on Attachment "G" in which Figure 2.16 shows a transducer for generating and detecting a surface wave that has completely different structure and operation than the transducers of Thompson ('836). In addition, the appellants rely on Attachments "H" and "I" to establish that the transducer of Thompson ('836) would not accurately measure surface waves if they were applied to the test piece.

The examiner's position (answer, page 4) is that since the propagating waves of Thompson ('836) "enter the test piece via said piece's surface and reflect there within via a surface of the piece . . . " that (*id.*) "said waves are deemed as including 'surface waves.'" In addition, the examiner takes the position that (answer, page 6) "some of these waves [of Thompson ('836)] are inherently going to include surface waves which propagate through the piece's surface layer." As a response to Attachments "A" - "I" submitted with the brief, and the appellants' accompanying arguments, the examiner states (answer, page 9) that

Appellants then counter the Examiner's rejection by providing arguments which take in excess of 15 pages

plus numerous pages of attachments to discuss the differences between the claimed surface waves vs. the taught surface waves of Thompson et al ("836"). Therefore, it seems as if "surface waves" are critical to Appellant's invention, yet very little mention was made of said waves in claim 1, (ie the independent claim in which all of said arguments addressed). It is of the Examiner's opinion that the Appellants' are reading much more in to [sic] claim 1, and specifically the surface waves than the chosen claim language warrants.

At the outset, we find that the specification describes a "surface wave" (page 7) as "a surface wave which propagates through the surface layer of the test piece," and (pages 8 and 18) as "a surface wave propagating in the surface layer of the test piece." In addition, the specification (page 32) discloses that "[t]he surface layer stress evaluation unit 63 evaluates the stress in the surface layer of the test piece based on the acoustic velocity of the surface wave"

We are in agreement with the appellants (brief, page 17) that Thompson ('836) is directed to (col. 3, lines 36-38) a transverse or shear wave that travels through the thickness of the test block 3 to the opposite face and reflected back to the transducer. Thompson ('836) states (col. 3, lines 21-36) that

[e]lastic waves can be propagated through a solid in a longitudinal mode . . . and in a transverse mode The technique known as shear wave birefringence utilizes only the transverse wave which is also known as the shear wave. Fig. 1 shows an electromagnetic transducer 1 mounted on a test block 3 which has a thickness "l." A current of suitable frequency is applied. . . to generate a transverse, or shear wave 5, traveling through the thickness of the block."

To the extent that Attachment "E" discloses (page 257) that "[i]n a solid elastic medium of finite size, a disturbance will produce surface waves in addition to waves moving through the bulk material," we note that according to Attachment "D" (page 851, col. 2), it is when waves move across an interface with different elastic properties, that the velocity, direction, and phase of the wave may be changed and will give rise to waves of other modes. The disclosure of Thompson ('836) is silent as to the creation of surface waves. We note the examiner's statement (answer, page 8) that Thompson ('836) does not state that the waves generated in his invention do not include surface waves. However, we are in agreement with the appellants (brief, page 14) that Thompson ('836) (col. 4, lines 65 through col. 5, line 2) makes clear that unidirectional driving forces are created, and that these

forces cause transverse waves to radiate into the material and propagate through the material. Of note is that Thompson ('836) does not make reference to any waves that propagate in the surface of the test block. However, the statement in Thompson ('836) (col. 3, lines 54-60) discussing changes in shear wave polarization, discloses that when the stress in the block is neither perpendicular nor parallel to the direction of the transducer, the shear wave is decomposed into two waves and that "[b]ecause these two polarized waves are traveling in material under different conditions of stress, their velocity will be different." From the statement in Attachment "D" **supra**, "when waves move across an interface with different elastic properties, the velocity, direction and phase of the wave may be changed and will give rise to waves of other modes" it may be implied that a surface wave could be inherently created in Thompson ('836). Assuming **arguendo** that the transducer of Thompson ('836) inherently produced some surface waves, we find that Thompson ('836) does not teach measuring an acoustic velocity of the surface wave. Nor does Thompson ('836) teach evaluating the stress based on a

difference in the acoustic velocities of a surface wave. We find that Thompson ('836) (col. 3, lines 36-38) is measuring the velocity of a transverse or shear wave. We are in agreement with the appellants (reply brief, page 12) that Thompson ('836) is measuring the stress across the thickness of the test piece (Figure 12), rather than measuring the velocity of a surface stress in a surface layer and evaluating the stress from the differences in acoustic velocities.

With regard to the examiner's assertion (answer, page 4) that Thompson et al ("836") teaches "evaluating the presence of stress in the test piece by a difference in the applied wave's velocity (col. 4, lines 16-19)," we note that claim 1 recites "evaluating stress at the loaded portion of said test piece based on a difference in acoustic velocities of said surface wave between the non-loaded portion and the loaded portion of said test piece."

As seen in Figures 7 and 11 of the appellants' disclosure, the loaded portion is closer to a weld than is the non-loaded portion. From the text of Thompson ('836) referred to by the examiner (col. 4, lines 16-19), we find that

Thompson ('836) is comparing velocity with a previously obtained correlation and does not teach comparing the velocities with different i.e., non-loaded and loaded portions of a test piece as recited in claim 1. We are therefore in agreement with the appellants (reply brief, page 10) that Thompson ('836) compares the difference in velocity "to a previously obtained correlation between velocity and stress in order to determine the stress . . . " and that in Thompson, the stress at the loaded portion of the test piece is not evaluated based on a difference in acoustic velocities of a wave between a non-loaded portion and the loaded portion of the test piece, as recited in claim 1.

We additionally note that although Thompson ('081) has not been relied upon by the examiner for a teaching of a surface wave, that Thompson ('081) discloses in Figure 6 the effect of stress on the velocities of ultrasonic energy on a test piece. Thompson ('081) states that for this embodiment (col. 7, lines 38-41) "the transducer head of the instrument could be fitted with shear wave generating transducers to obtain

appropriate measurements for deriving the stress information." Thompson ('081) additionally states (col. 7, lines 36-37) that this embodiment utilizes "horizontally polarized shear waves." While Thompson ('081) characterizes this embodiment as utilizing shear waves, we take Official Notice that the phrase "horizontally polarized shear waves" refers to a Love² wave, which the appellants have defined in Attachment "E" as a surface wave. Accordingly, we find that Thompson ('081) teaches the use of a surface wave which propagates in a surface layer of a test piece.

However, Thompson ('081) does not make up for the deficiencies of Thompson ('836). We find that although the three arrays of transducer sets disclosed in Figure 4 of Thompson ('081) disclose each array to be positioned at a different angular orientation (col. 6, line 48 et seq.), that Thompson ('081) does not teach evaluating the stress at loaded portions based on a difference in acoustic velocities of a

² IBM Technical Disclosure Bulletin, June 1970, US, Vol. 13, Issue No. 1, pp. 269-270, sets forth that "Acoustical waves, discovered by Love, propagating a layer on a substrate are defined as horizontally polarized shear waves . . ." A copy of the text of the document is attached to this decision.

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surface wave between the non-loaded and loaded portions.
Thompson ('081) therefore does not teach "evaluating stress at the loaded portion of said piece based on a difference in acoustic velocities of said surface wave between the non-loaded portion and the loaded portion of said test piece" as recited in claim 1. We additionally find that Hildebrand does not overcome the deficiencies of Thompson ('836) as Hildebrand is not directed toward the propagation of surface waves. Accordingly, we will reverse the rejection of claim 1 under 35 U.S.C. § 103. As claims 4 and 12 depend from claim 1, the rejection of claims 4 and 12 under 35 U.S.C. § 103 is also reversed.

CONCLUSION

To summarize, the decision of the examiner to reject claims 1, 4 and 12 under 35 U.S.C. § 103 is reversed.

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REVERSED

KENNETH W. HAIRSTON)	
Administrative Patent Judge)	
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LANCE LEONARD BARRY)	APPEALS
Administrative Patent Judge)	AND
)	INTERFERENCES
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